

CLAIMS

1. A two-dimensional photonic crystal formed by a periodical two-dimensional arrangement of plural unit lattices, comprising:
5 a prism-shaped first dielectric area arranged at each lattice point of the unit lattice;
a prism-shaped second dielectric area arranged at an approximate center of the unit lattice; and
a third dielectric area adjacent to and around the first and second dielectric areas.
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2. A two-dimensional photonic crystal according to claim 1, characterized in that the third dielectric area has a relative dielectric constant different from relative dielectric constants of the first and second dielectric areas.
- 15 3. A two-dimensional photonic crystal according to claim 2, characterized in that the unit lattice is a tetragonal lattice.
4. A two-dimensional photonic crystal according to claim 3, characterized in that the first dielectric area and the second dielectric area have a substantially cylindrical shape
20 and satisfy a relationship:
$$0.4a \leq r1 + r2 \leq 0.6a$$

wherein r1 indicates a radius of the cylindrical first dielectric area, r2 indicates a radius of the cylindrical second dielectric area, and a indicates a unit length of a lattice axis of the tetragonal lattice.
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5. A two-dimensional photonic crystal according to claim 3, characterized in that a relative dielectric constant $\epsilon 1$ of the first dielectric area is equal to a relative dielectric constant $\epsilon 2$ of the second dielectric area.
- 30 6. A two-dimensional photonic crystal according to claim 3, characterized in that a relative dielectric constant $\epsilon 1$ of the first dielectric area is smaller than a relative dielectric constant $\epsilon 2$ of the second dielectric area.

7. A two-dimensional photonic crystal according to any one of claims 2 to 5, characterized in that a relative dielectric constant ϵ_3 of the third dielectric area satisfies at least a relation $\epsilon_3 > \epsilon_1$.

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8. A two-dimensional photonic crystal according to claim 2, characterized in that a relative dielectric constant ϵ_1 of the first dielectric area, a relative dielectric constant ϵ_2 of the second dielectric area, and a relative dielectric constant ϵ_3 of the third dielectric area satisfy relations:

10 $\epsilon_3 > \epsilon_1$, and $\epsilon_2/\epsilon_1 > 20$.

9. A two-dimensional photonic crystal according to any one of claims 1 to 4, characterized in that the first and second dielectric areas are formed by air and the third dielectric area is formed by a dielectric material containing a ceramic material.

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10. A two-dimensional photonic crystal according to any one of claims 1 to 6, characterized in that the first and second dielectric areas are formed by a dielectric material containing a ceramic material and the third dielectric area is formed by air.

20 11. A two-dimensional photonic crystal according to any one of claims 1 to 8, characterized in that the first, second and third dielectric areas are formed by a dielectric material containing a ceramic material.

25 12. A two-dimensional photonic crystal according to any one of claims 1 to 11, characterized in that a unit length a of the lattice axis of the tetragonal lattice is different depending on a frequency of a light or an electromagnetic wave entering the two-dimensional photonic crystal.

30 13. A photonic crystal waveguide characterized in including a two-dimensional photonic crystal according to any of claims 1 to 12, wherein a linear defect is formed in a periodical lattice arrangement of the two-dimensional photonic crystal.

14. A photonic crystal resonator characterized in including a two-dimensional photonic crystal according to any of claims 1 to 12, wherein a point-shaped defect is formed in a periodical lattice arrangement of the two-dimensional photonic crystal.